REMARKS

By this Amendment the insertion previously proposed to page 6, line 20 of the specification has been corrected.

In the outstanding final Office Action the examiner has objected to the Amendment filed July 26, 2007 because the added phrase "an astable timer having a duty cycle which is controlled by output voltage and adjusted by input voltage" is new matter.

This objection is incorrect and should be withdrawn. Fig. 2 identifies the use of an "NE556" circuit in the inventive control unit, and such circuitry is well known as an astable timer (see attached Fairchild Semiconductor brochure). The fact that it is controlled by output voltage and adjusted by input voltage is obvious.

The examiner has again rejected claims 1, 2, 5 and 6 under 35 U.S.C. 103(a) as being unpatentable over Bastholm et al. in view of Weimer et al., and again stated that claims 3 and 4 contain allowable subject matter.

The inventor continues to assert no combination of Bastholm et al. and Weimer et al would suggest use of an astable time with duty cycle as defined in claims 1, 5 and 6. All of claims 1-6 should be allowed.

Respectfully submitted,

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By: _____

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LM556/NE556

Dual Timer

Features

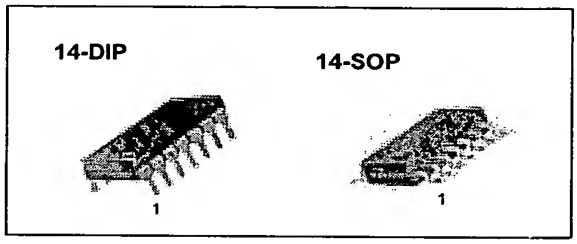
- Replaces Two LM555/NE556 Timers
- Operates in Both Astable And Monostable Modes
- High Output Current
- TTL Compatible
- Timing From Microsecond To Hours
- Adjustable Duty Cycle
- Temperature Stability Of 0.005% Per °C

Applications

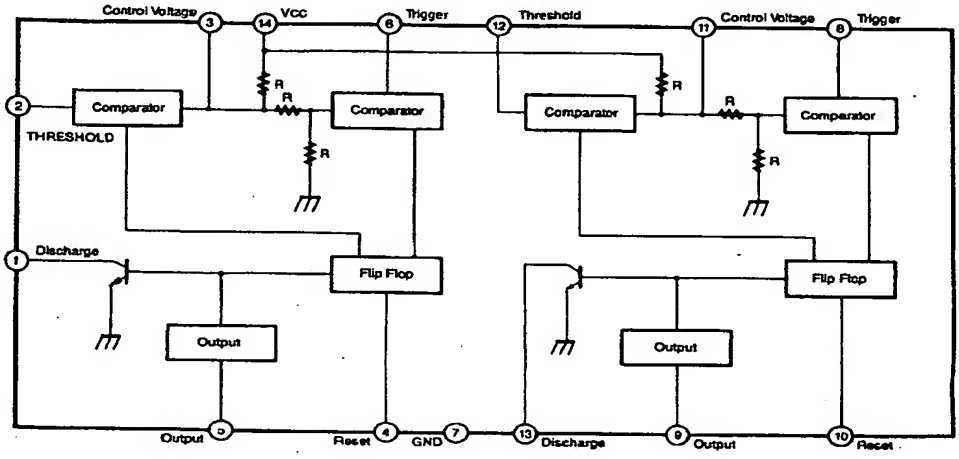
- Precision Timing
- Pulse Shaping
- Pulse Width Modulation
- Frequency Division
- Traffic Light Control
- Sequential Timing
- Pulse Generator
- Time Delay Generator
- Touch Tone Encoder
- Tone Burst Generator

Description

The LM556/NE556 series dual monolithic timing circuits are a highly stable controller capable of producing accurate time delays or oscillation. The LM556/NE556 is a dual LM555. Timing is provided an external resistor and capacitor for each timing function. The two timers operate independently of each other, sharing only V_{CC} and ground. The circuits may be triggered and reset on falling waveforms. The output structures may sink or source 200mA.



Internal Block Diagram



Rev. 1.0.0

Absolute Maximum Ratings (T_A = 25°C)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	16	V
Lead Temperature (soldering 10sec)	T_{LEAD}	300	°C
Power Dissipation	P_D	600	mW
Operating Temperature Range LM556/NE556	T_{OPR}	0 ~ + 70	°C
Storage Temperature Range	T_{STG}	- 65 ~ + 150	°C

Electrical Characteristics

(T_A = 25°C, V_{CC} = 5 ~ 15V, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Supply Voltage	V_{CC}	-	4.5	-	16	V
Supply Current *1(two timers) (low state)	I_{CC}	V_{CC} = 5V, R_L = ∞ V_{CC} = 15V, R_L = ∞	-	5 16	12 30	mA mA
Timing Error *2(monostable) Initial Accuracy Drift with Temperature Drift with Supply Voltage	ACCUR Δt/ΔT Δt/ΔVCC	R_A = 2KΩ to 100KΩ C = 0.1μF T = 1.1RC	-	0.75 50 0.1	-	% ppm/°C %/V
Control Voltage	V_C	V_{CC} = 15V	9.0	10.0	11.0	V
		V_{CC} = 5V	2.6	3.33	4.0	V
Threshold Voltage	V_{TH}	V_{CC} = 15V	8.8	10.0	11.2	V
		V_{CC} = 5V	2.4	3.33	4.2	V
Threshold Current*3	I_{TH}	-	-	30	250	nA
Trigger Voltage	V_{TR}	V_{CC} = 15V	4.5	5.0	5.6	V
		V_{CC} = 5V	1.1	1.6	2.2	V
Trigger Current	I_{TR}	V_{TR} = 0V	-	0.01	2.0	μA
Reset Voltage*5	V_{RST}	-	0.4	0.6	1.0	V
Reset Current	I_{RST}	-	-	0.03	0.6	mA
Low Output Voltage	V_{OL}	V_{CC} = 15V I_{SINK} = 10mA I_{SINK} = 50mA I_{SINK} = 100mA I_{SINK} = 200mA V_{CC} = 5V I_{SINK} = 8mA I_{SINK} = 5mA	-	 0.1 0.4 2.0 2.5 0.25 0.15	 0.25 0.75 3.2 0.35 0.25	V V
High Output Voltage	V_{OH}	V_{CC} = 15V I_{SOURCE} = 200mA I_{SOURCE} = 100mA	 12.75	 12.5 13.3	-	V
		V_{CC} = 5V I_{SOURCE} = 100mA	2.75	3.3	-	V
Rise Time of Output	t_R	-	-	100	300	ns
Fall Time of Output	t_F	-	-	100	300	ns
Discharge Leakage Current	I_{LKG}	-	-	10	100	nA
Matching Characteristics*4 Initial Accuracy Drift with Temperature Drfit with Supply Voltage	ACCUR Δt/ΔT Δt/ΔVCC	-	-	1.0 10 0.2	2.0 0.5	% ppm/°C %/V
Timing Error (astable)*2 Initial Accuracy Drift with Temperature Drift with Supply Voltage	ACCUR Δt/ΔT Δt/ΔVcc	V_{CC} = 15V R_A,R_B = 1KΩ to 100KΩ C = 0.1μF	-	2.25 150 0.3	-	% ppm/°C %/V

Notes:

*1. Supply current when output is high is typically 1.0mA less at V_{CC} = 5V

*2. Tested at V_{CC} = 5V and V_{CC} = 15V

*3. This will determine the maximum value of R_A + R_B for 15V operation.
The maximum total R = 20MΩ, and for 5V operation the maximum total R = 6.6MΩ.

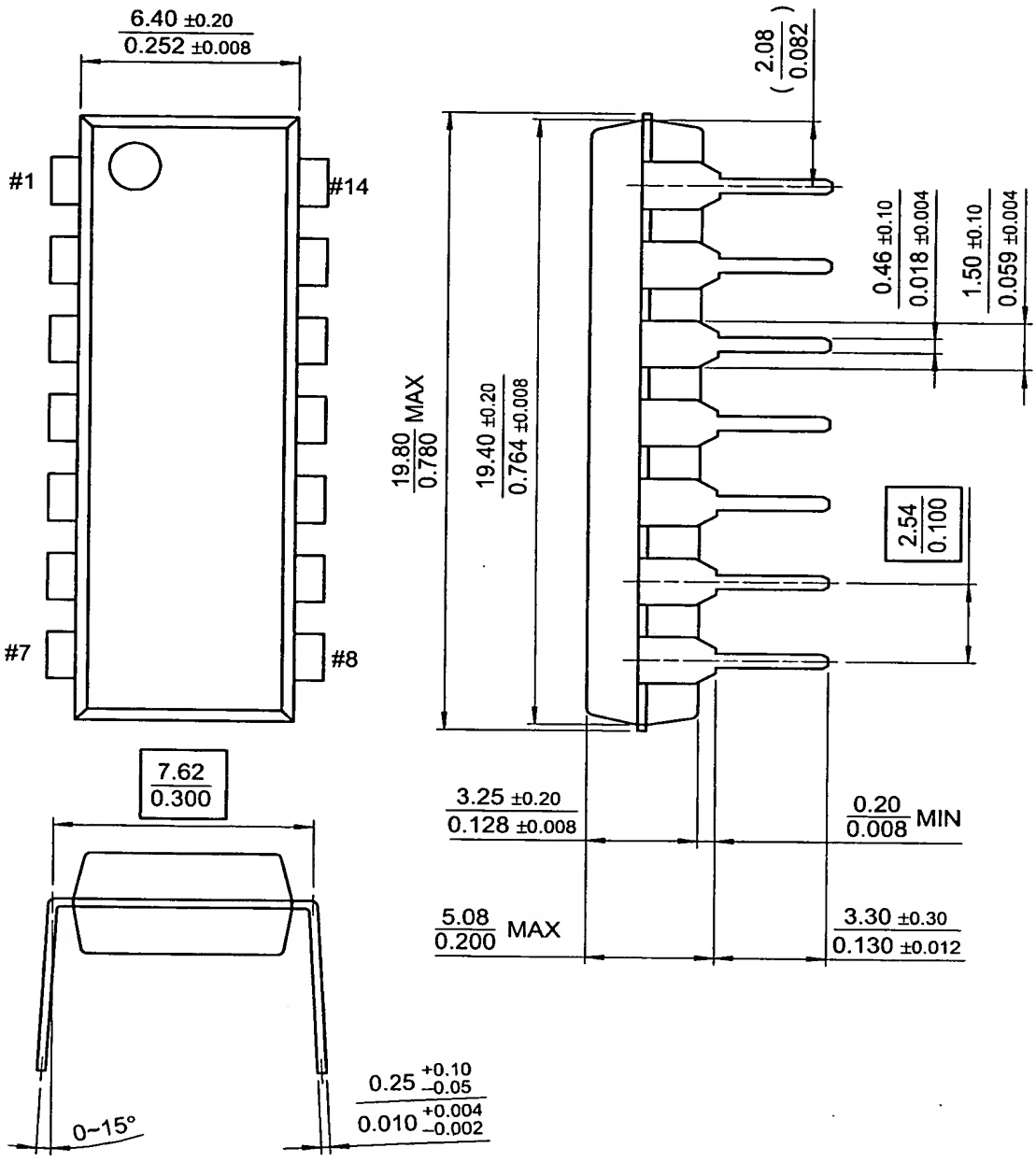
*4. Matching characteristics refer to the difference between performance characteristics of each timer section in the monostable mode.

*5. As reset voltage lowers, timing is inhibited and then the output goes low.

Mechanical Dimensions

Package

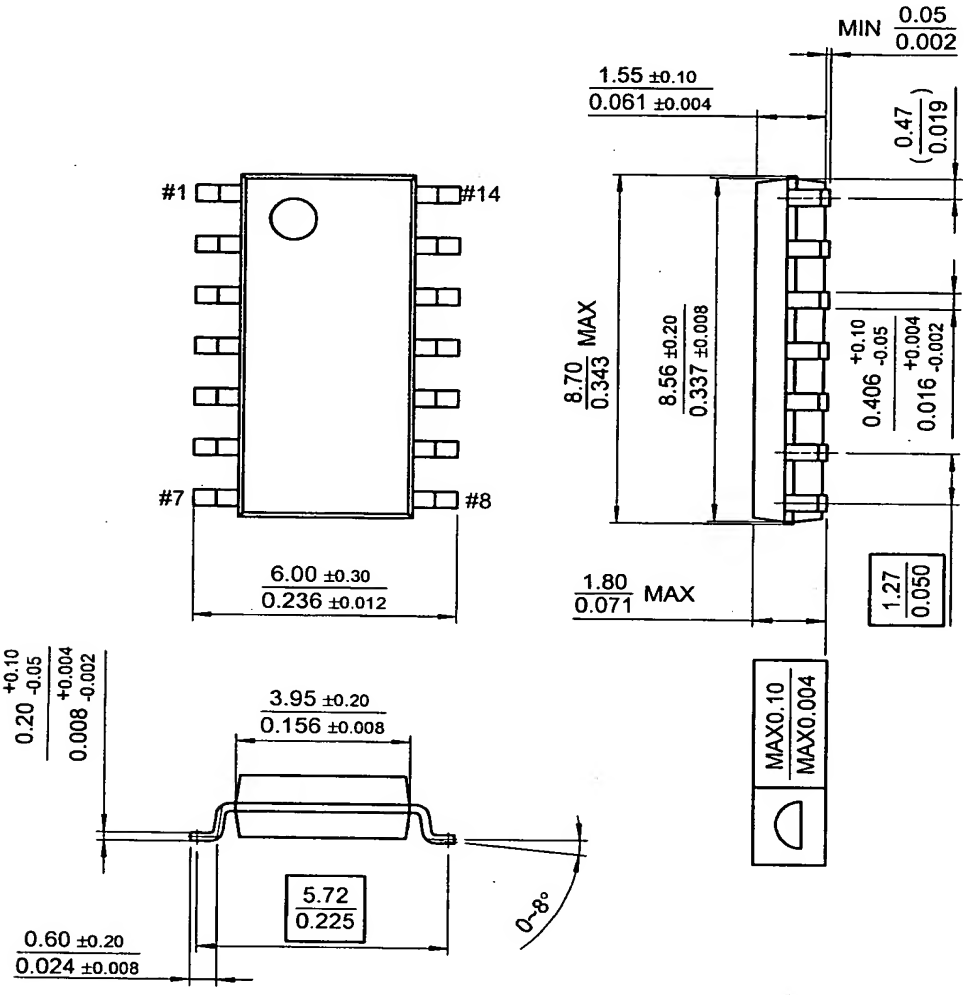
14-DIP



Mechanical Dimensions (Continued)

Package

14-SOP



Ordering Information

Product Number	Package	Operating Temperature
LM556CN	14-DIP	0 ~ + 70°C
LM556CM	14-SOP	
NE556	14-DIP	
NE556D	14-SOP	

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